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## A SKETCH OF PLANT CLASSIFICATION FROM THEOPHRASTUS TO THE PRESENT\*

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The history of plant classification begins with the ancients, but little progress was made till the time of the sixteenth century. Gradually the idea of natural affinity developed, but it was not till the nineteenth century, with the acceptance of the doctrine of evolution, that the significance of affinity was realized.

The present article mentions men and publications that have chiefly influenced the development of the classification of the higher plants. Thanks are due to Dr. C. S. Gager for the suggestion leading to these studies.

### EARLIEST WRITERS

Theophrastus, "first of real botanists in point of time," was born about 370 B.C. on Mitylene, the island off Asia Minor where Aristotle taught Alexander. Theophrastus became a pupil of Aristotle in Athens, and later his successor. He wrote on many subjects; his "History of Plants," the oldest botanical work in existence, has recently been translated into English. About five hundred species, chiefly cultivated plants, are taken up. "In considering the distinctive characters of plants and their nature," he writes, "one must take into account their parts, their qualities, the way in which their life originates, and the course which it follows in each case. . . . It has not been satisfactorily determined what ought and what ought not to be called parts of plants. . . . The most important classes of plants are tree, shrub, undershrub and herb." Of flowers he says:

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“Some are downy as mulberry, some leafy (with petals) as apple. Some consist of a single leaf as morning glory. The thistle has a flower attached to each seed.” In his will Theophrastus bequeathed his garden to his friends and to all those who will spend their time with them in learning and philosophy, and expressed his desire to be buried there. Eighteen hundred years were to pass before more extensive botanical studies were made.

Dioscorides was a Greek physician of the first century A.D. From his writings it is evident that he traveled widely. His work on medical plants was considered an infallible authority for sixteen centuries; numerous editions and commentaries in many languages have been published.

Pliny the Elder was a Roman admiral, killed by the eruption of Vesuvius, A. D. 79. His interesting but inaccurate *Historia Naturalis* describes the world, heavenly bodies, geography, animals and plants, accompanied by numerous anecdotes. Books XII–XXVII deal with plants, especially trees and medicinal plants. “It now remains,” he writes, “to speak of the vegetable productions of the earth . . . from the forest man first obtained his food . . . trees formed the first temples of the gods . . . the beech is dedicated to Jupiter,” etc. The great prestige of Pliny’s work was partly due to its being the only work of its kind in Latin.

Little was added to the knowledge of plants between the time of Theophrastus and the sixteenth century. During the middle ages, it has been said, the Arabs kept aflame the lamp of knowledge. Plant names such as oryza, alfalfa, alkanna and azedarac testify to their studies. Writings about plants were connected with their use in medicine, and often described magic and rites to be used in gathering or preparing the herbs. According to the curious doctrine of signatures, plants indicated their use in healing as, for example, by heart-shaped or liver-shaped leaves.

#### SIXTEENTH CENTURY

The herbalists of the Rhine, Brunfels, Bock, and Fuchs, called by Sprengel the German fathers of botany, were the first to

make pictures and descriptions direct from nature. Otto Brunfels was a monk who embraced Protestantism and became a teacher. His *Herbarum Vivæ Icones* (1530) contains one hundred and thirty-five beautiful and naturalistic illustrations of plants from the Strasburg region. He often quotes Dioscorides, but does not realize that he deals with a different flora.

Leonard Fuchs, professor of medicine at Tübingen, made about five hundred drawings for his *Stirpium Historia*. The plants are arranged alphabetically by Greek names. "There is nothing in this life pleasanter and more delightful," he writes, "than to wander over woods, mountains and plains adorned with flowers and plants of various sorts and to gaze intently upon them."

Bock, or Tragus, criticized Fuch's alphabetical arrangement. In his *Neu Kreuterbuch*, with descriptions in German, he describes herbs, shrubs and trees "keeping together such forms as nature seems to have linked together by similarity of form." The shape of leaves, branching, roots, size and color of flowers, but not their structure, were noted. "Mushrooms," he says, "are neither herbs nor roots, neither flowers nor seeds, but merely the superfluous moisture of the earth and trees." It was generally understood ferns had no seeds; for four years, Bock says, he kept vigil all midsummer night, and always found very minute black seeds on the pieces of cloth he had placed under the plants; moreover, he employed no cabalistics, conjurings or magic of any kind.

The *Botanologicon* by Euricius Cordus is an interesting account of an imaginary conversation about plants between Cordus and his friends. It clearly explains that the plants of the ancients do not grow in Central Europe. His son, Valerius Cordus, lectured on botany in Wittenberg but died of fever in Rome when only twenty-nine. His works were published after his death. He urged botanists to cease copying the descriptions of the ancients and to describe anew from nature. According to Tournefort, he was "the first of all men to excel in plant description."

In Italy Andrea Cesalpini published *De Plantis Libri XVI* in

1583. The introduction, of thirty pages, is a general discourse on plants. Woody plants and herbs are fundamental groups, he says, because taking food up through the stem is the first function of plants. The second function is reproduction, therefore fruit and seed characters should be considered next.

Lobelius, of Lille, distinguished groups by leaves, and thus roughly separated dicotyledons and monocotyledons.

#### SEVENTEENTH CENTURY

The important work, *Pinax Theatri Botanici* (1623), by Gaspard Bauhin, of Basel, described more than six thousand species of plants, many more than any previous book. Genera are named with synonyms, without being characterized. Species are tersely described: root, leaves, flowers, fruit and seed in order. There are no larger groups, but the arrangement implies a classification: such groups as grasses, lilies, shrubs and trees, and seaweeds are kept together. Corals and sponges are still classed as plants.

The *Isagoge Phytoscopia* by Joachim Jung, of Hamburg, was published after his death. He was the first to state that woody plants and herbs should not form a fundamental division. This important point was ignored until the time of the Jussieus.

The perfecting of the microscope and anatomical studies, begun by Malpighi in Italy and Grew in England, prepared the way for greatly improved systems. Grew called attention to the importance of the number of cotyledons. Stamens are called the attire, flowers the lodging and dining room of insects. Later he said stamens are male organs. About the same time Camerarius of Tübingen first conducted experiments proving that pollen is needed to produce perfect seeds. His important work passed almost unnoticed for a century.

John Ray retained woody plants and herbs as main divisions, although reprinting Jung's work in the preface to his great *Historia Plantarum*. This work, the publication of which was begun in 1686 (a year before Newton's *Principia*), was intended to describe all plants known. Following Grew's suggestion he

established the groups monocotyledons and dicotyledons as subdivisions of herbs. This important improvement was ignored by Tournefort and Linnaeus. His final groups (1703) were:

HERBAE	{	Flore destitutae	
	{	Floriferae	{ Dicotyledones
			{ Monocotyledones
ARBORES	{	Flore a fructo remoto	
		Flore fructui contiguo	

Ray's German contemporary and opponent, Rivinus, advocated binomial nomenclature. Magnol, of the Paris School of Medicine, was the first to use the term "family." "I think I can perceive in plants a certain affinity between them," he writes, "so that they might be ranged in different families, as we class animals. . . . There is a certain affinity, as it were, which does not exist in any of the parts considered separately, but only as a whole."

Tournefort was professor of botany at the Jardin du Roi, under Louis XIV. His botany was in many respects less satisfactory than that of Ray. He emphasized characters of the corolla. The very clear arrangement, particularly of genera, made his *Institutiones Rei Herbariae* (1700) very suitable for reference; it became the standard authority until the time of Linnaeus. His groups are:

HERBAE	{	Petalodes	{ Simplices Monopetali
			{ Simplices Polypetali
			{ Compositi
	{	Apetali	
ARBORES	{	Apetali	{ Apetali
			{ Amentacei
		Petalodes	{ Monopetali
			{ Polypetali

#### EIGHTEENTH CENTURY

Vaillant, pupil of Tournefort, in 1717 called attention to Grew's views about anthers, and urged that stamens and pistils are the essential parts of flowers.



Carl Linné, second father of botany, generally known as Linnaeus, was born in 1707, the same year as Buffon and Bernard de Jussieu. His father was a country minister in southern Sweden. He made little progress in other studies, but early displayed his love and knowledge of plants. After years of struggle with poverty he went to Holland; here were published the famous *Systema Naturae* and *Genera Plantarum*. At thirty-five he became professor of botany in Upsala, the chief university of Sweden. Linnaeus was the first to adopt uniformly the binomial nomenclature for plants and animals, a reform almost at once generally adopted. By his "sexual system" plants are arranged simply according to the number of stamens and pistils, thus providing ready pigeon-holes for new species. His *Species Plantarum* (1753) is generally taken as the starting point for specific names. "There are as many species as were created in the beginning," Linnaeus says. Later in life he suggested that perhaps the genera only had been formed "in the beginning." He recognized his system as artificial; it was but a thread of Ariadne, to help him find his way in the labyrinth of facts. "A natural classification," he writes in the *Philosophia Botanica*, "is the first and last aim of systematic botany. I have long sought but have not been able to perfect it; I shall seek it as long as I live." The vegetable kingdom includes seven "families": fungi, algae, mosses, ferns, grasses, palms and plants. He then proposed sixty-seven "natural orders" (a few ending in *-aceae*, others in *-ales*). He does not describe them, but names their genera. "I will not give my reasons for the distribution of natural orders," he said to a pupil. "You or some other person after twenty or fifty years will discover them and see that I was right."

During the next hundred years a great number of works were published on the Linnaean system, especially in Germany and England.

In France the system was never established. "Why should a Linnaeus persuade us to call a dog *Canis familiaris*?" said Buffon. Adanson, in his *Familles des Plantes* also attacked Linnaeus;

there should be, he says, a great work describing all genera under the natural families.

Bernard de Jussieu attempted to lay out the Royal Gardens at Versailles by a natural system. Following Jung, he abandoned the groups woody plants and herbs. He adopted Linnaeus's natural families, but grouped these according to suggestions from Ray, Tournefort and his own observations. He was continually improving his system and did not publish anything. "What does it signify," he said, "who gets the credit, so long as the truth becomes known?" His nephew, Antoine Laurent de Jussieu (1748-1816) came to Paris to assist him, and further improved his uncle's system. At the outbreak of the French Revolution he published *Genera Plantarum secundum Ordines Naturalis Disposita*. The last sheets were drawn from the press on July 13, 1789, the day before the fall of the Bastille. His groups are:

ACOTYLEDONES (fungi, ferns, mosses, algae, and naiades, 1)

MONOCOTYLEDONES (hypogynae, 2, perigynae, 3, and epigynae, 4)

DICOTYLEDONES (apetalae, 5-7, monopetalae, 8-11, polypetalae, 12-14, and dielines irregulares, 15)

The numbers refer to his fifteen classes, under which one hundred families are distinguished, and under them the genera are described. His work was for long unfavorably received, the Linnaean system being more effective to find quickly the names of plants. The Jussieus are justly regarded as the founders of the conception of natural plant families, in fact of the first approximation to a natural classification.

(To be continued)